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EXAMINER

PADGETT, MARIANNE L

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Paper # 35

MAILED
APR 04 2005
GROUP 1700

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 09/187,551
Filing Date: November 05, 1998
Appellant(s): MUSAKA ET AL.

Chun-Pok Leung
For Appellant

Supplemental EXAMINER'S ANSWER

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This is in response to the Remand of 7/31/2003, and revises the recapture rejection on p.5-7 of the Examiner's Answer (paper No.31, mailed 10/25/2002). All other rejections therein are maintained.

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Claims 27-29 and 31-33 are rejected under 35 U.S.C. 251 as being an improper recapture of broadened claimed subject matter surrendered in the application for the patent upon which the present reissue is based. See *Hester Industries, Inc. v. Stein, Inc.*, 142 F.3d 1472, 46 USPQ2d 1641 (Fed. Cir. 1998); *In re Clement*, 131 F.3d 1464, 45 USPQ2d 1161 (Fed. Cir. 1997); *Ball Corp. v. United States*, 729 F.2d 1429, 1436, 221 USPQ 289, 295 (Fed. Cir. 1984). A broadening aspect is present in the reissue, which was not present in the application for patent. The record of the application for the patent shows that the broadening aspect (in the reissue) relates to subject matter that applicant previously surrendered during the prosecution of the application. Accordingly, the narrow scope of the claims in the patent was not an error within the meaning of 35 U.S.C. 251, and the broader scope surrendered in the application for the patent cannot be recaptured by the filing of the present reissue application.

In order to make the claims allowable over the prior art in parent application 08/259,584, the specific halogen F, as well as the specific type of fluorine source, CX_4 or $CX_3-(CX_2)_n-CX_3$ were added to the claims as well as the minimum concentration of F, [F], in the deposited silicon oxide (detailed prosecution history presented below). The new claims introduced in the reissue broaden the scope of the claims to include all types of halogens from any source and do not require a minimum [F], thus broadening the scope of the process claims to include reagents and proportions thereof, excluded in the 08/259,584 prosecution. Furthermore, while the new claims, as exemplified by claims 27, relate the deposition of a layer deposited from gases comprising Si, O and halogen to "a desired stress" or "a tensile stress", this stress and the concentration of fluorine are inherently related, as can be seen in appellant's graphs (Figs. 9-13) or in Homma (EPO 517,548 or USPN 5,288,578) in col. 4 of the EPO reference, hence removing the concentration and source limitations is recapture. These claims are stating an effect caused by the [F] previously claimed, are essentially paraphrasing in order to broaden the claims, i.e., recapture of previously excluded or surrendered limitations or conditions. There are no actual differences that are not broadening the scope to the steps of the process for making the silicon oxide layer, just in

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which characteristic are chosen to be measured or how one chooses to describe the deposit after making it.

To restate the issue, controlling the stress is intimately or inherently related to controlling the F concentration, hence to claim stress with no clearly defined metes and bounds, in essence recaptures F-concentrations (and other halogens) that were excluded by limitations in the patented claims, as may be suggested by comparing values in Figures 10 and 13, however since no information is given on plasma conditions, except flow and gas type, one cannot be sure the same deposition processes are being compared in Figures 10-13. For example, Fig. 10 has no data point above 400 sccm C_2F_6 , so the specification provides no factual information on [F] in the deposits that Mr. Musaka's Declaration says represent tensile stress. As the specification identifies all deposits in the process as having compressive stress, when the type of stress is named, the contradictions between the specification and Declaration are a problem that cannot be corrected by unsupported allegations by appellant's representatives. Claim 34 dependent on claim 33 includes the limits of the PN. 5,571,57's claims, so is not included above, but the claimed process conditions broader than this, recapture plasma silicon oxide deposition process conditions previously excluded.

Mr. Musaka's Declaration deals only with Fig. 13, and does not tie the information into the rest of the specification, which exclusively discusses (positive) compressive stress for all deposits exemplified for the appellant's invention, hence there are no teachings of desired deposits characterized by tensile stress. Appellant's allegations on page 11 of the brief, that the compressive stress in the specification are only magnitudes and no negative sign is necessary, remain unsupported, so the evidence in the specification, which is sworn to, must be given the greater weight when considering these issues.

The Prosecution History

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With regard to this recapture issue, the prosecution history of the original application (08/259584 which issued as Pat. No. 5,571,571) is as follows.

The originally-presented independent claims are:

Claim 1. A method of forming a conformal thin film of silicon oxide on a substrate having closely spaced conductive lines thereon comprising the steps of:

forming a plasma by means of an electrical source in a vacuum chamber;

introducing into the plasma a reaction gas comprising a mixture of tetraethylorthosilicate and a preselected halogen-containing gas; and

subjecting the substrate to the plasma to deposit a high quality layer of silicon oxide onto the substrate without the formation of voids in the film.

Claim 11. A method for forming a conformal thin film of silicon oxide over a substrate having closely spaced conductive lines thereon in a plasma chamber comprising

Introducing into the chamber as a plasma precursor gas a vaporized TEOS in a carrier gas and a fluorocarbon and thereafter forming a plasma therefrom, to deposit a high quality layer of silicon oxide over said conductive lines.

On January 10, 1995, the Examiner rejected claims 1-15 under 35 USC 102(b), 102(e) and 103 over prior art to Lane, Ishihara, Yamazaki, Küyel, Nguyen, Webb, Yu, Lory, Otsubo, Wang and Weise. In response, Applicant amended claims 1-15 on July 11, 1995 to include the limitations (1) fluorine and (2) plasma above the substrate.

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On October 4, 1995, the Examiner issued a final rejection and rejected amended claims 1-15 under 35 USC 102(b), 102(e) and 103 over the same prior art as cited above (the statement of the rejection was revised from that of the first Office action). In Applicant's after-final amendment filed February 12, 1996, which was entered, Applicant amended the independent claims to include limitations 3) halocarbon selected from CX₄ and CX₃-(CX₂)_n-CX₃, wherein X is hydrogen or halogen, n is an integer from 1 to 5, at least 1 X is fluorine and 4) at least about 2.5 atomic percent of fluorine. A "312 amendment" filed June 14, 1996 and entered contained no significant changes with regard to the recapture issue.

The issued independent claims are as follows:

Claim 1. A method of forming a conformal thin film of silicon oxide on a substrate having spaced conductive lines thereon comprising the steps of:

mounting a substrate onto a substrate support in a vacuum chamber;

forming a plasma in the vacuum chamber in a region above the substrate by means of an electrical power source from a reaction gas comprising a mixture of tetraethylorthosilicate and a fluorine-containing halocarbon gas selected from the group consisting of CX₄ and CX₃-(CX₂)_n-CX₃ wherein X is hydrogen or halogen and n is an integer from 0 to 5 with the proviso that at least one X is fluorine; and

subjecting the substrate to the plasma so as to deposit a layer of silicon oxide containing at least about 2.5 atomic percent of fluorine onto the substrate without the formation of voids in the film.

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Claim 8. A method of forming a conformal thin film of silicon oxide over a substrate having spaced conductive lines thereon in a plasma chamber comprising

mounting a substrate in said chamber;

introducing into the chamber in a region above said substrate as a plasma precursor gas vaporized tetraethylorthosilicate in a carrier gas including oxygen and a fluorocarbon selected from the group consisting of CX_4 and $CX_3-(CX_2)_n-CX_3$ wherein X is hydrogen or fluorine and n is an integer from 0 to 5 with the proviso that at least one X is fluorine;

and thereafter forming a plasma therefrom, so as to deposit a layer of silicon oxide containing at least about 2.5 atomic percent of fluorine over said conductive lines.

Reissue claims on appeal rejected for recapture (claims 27-29 and 31-33):

The reissue independent claim is as follows:

Claim 27. A method of forming a layer of silicon oxide over a substrate having spaced conductive lines thereon in a process chamber, the method comprising:

introducing a selected process gas comprising tetraethylorthosilicate and oxygen into the process chamber;

adding a flow of halogen source to the selected process gas at a flow rate previously determined to achieve a desired stress in the layer from a plasma enhanced reaction of the selected process gas and the flow of the halogen source at the flow rate, the desired stress in the layer being a tensile stress instead of a compressive stress in another layer formed from another plasma enhanced reaction of the selected process gas without the flow of the halogen source; and

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forming the layer with the desired tensile stress from the plasma enhanced reaction of the selected process gas and the flow of the halogen source at the flow rate.

Appellant's Arguments presented:

In Appellant's brief filed June 3, 2002, Appellant stated "even assuming *arguendo* that the change of the stress in the layer were inherently related to the fluorine concentration, the formation of a layer at the flow rate selected to produce a tensile stress instead of a compressive stress in the layer would still not be incidental, mere verbiage, or inherent." (p. 14). Appellant further argued the claim is directed to adding a flow of a halogen source to achieve a tensile stress instead of a compressive stress that would otherwise result without the flow of the halogen source (p. 15). In addition, Appellant stated that the Declaration of Musaka (§ 6) indicated Fig. 13 shows a reduction of the magnitude of compressive stress of about -1.25×10^9 dyne/cm² at zero C₂F₆ flow, with higher C₂F₆ rates, where the stress changes from negative (compressive) to positive (tensile) at about 450 sccm C₂F₆ flow rate (p. 11).

Appellant's supplemental Brief filed December 30, 2002 primarily reiterated arguments presented in the first Brief and did not add new arguments with regard to the recapture issue.

Response to Argument/Analysis:

The above rejection of reissue claims 27-29 and 31-33 under 35 USC 251 as being an improper recapture of subject matter surrendered in the application upon which the present reissue is based should be maintained for the following reasons.

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In the original application for patent, the claims were rejected based on prior art prior resulting in the addition of:

- (1) the halogen source being fluorine,
- (2) the fluorine source being CX_4 or $CX_3-(CX_2)_n-CX_3$, and
- (3) the minimum fluorine concentration being 2.5 atomic percent.

Additionally, appellant argued the limitations (1) through (3) as not being disclosed nor taught in the prior art of record, after which the claims were allowed.

In the instant reissue application, claims 27-29 and 31-33 do not include the limitations of (1) through (3). However, in the original patent prosecution, to overcome the prior art rejection against the claims, the appellants rewrote the claims to add limitations (1) through (3). The appellant made the choice of inserting those claim limitations into the original independent claims, in a rewritten form. The appellant chose not to prosecute further variations of the original independent claims. At the present, on reissue, appellant is not permitted to completely delete, i.e., omit, all of limitations (1)-(3) that were relied upon in for patentability See *Pannu v. Storz Instruments, Inc.*, 258 F.3d 1366, 59 USPQ2d 1597 (Fed. Cir. 2001), discussed below.

Consideration of Eggert :

The decision in *Ex Parte Eggert*, Appeal No. 2001-0790 (Bd. Pat. App. & Inter., decided May 29, 2003) (precedential opinion of an expanded panel of the Board) is not applicable to claims 27-29 and 31-

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33. In *Eggert*, the limitation relied-upon in the original patent prosecution to define over the prior art was not omitted in its entirety in the reissue claims, but rather was broadened. The reissue claims thus remained narrowed, as compared with the surrendered claim subject matter in the area related to (germane to) what was surrendered, and recapture was avoided in *Eggert*.

In the present instance, the reissue claims were either (a) not narrowed as compared with the surrendered claim subject matter, or (b) were narrowed, as compared with the surrendered claim subject matter only in areas not related to (not germane to) what was surrendered. Both (a) and (b) will now be discussed.

(a) Appellant has argued that the surrendered claim subject matter has been narrowed with regard to adding a flow of a halogen source to achieve a tensile stress instead of a compressive stress that would otherwise result without the flow of the halogen source. This was, however, already inherent in the claims that were finally rejected by virtue of appellant's inclusion (via the July 11, 1995, amendment) of fluorine in the claims, and as to the claims rejected in the first action, virtue of the halogen in the claims. It would appear that Applicant is alleging that the issued claims utilize compressive stress while the reissue claims utilize tensile stress. This is simply not the case. In both sets of claims, the layer was formed from a gas mixture containing a halogen, introduced as one step or two steps. None of the claims in either set excludes a halogen. If compressive stress results from a gas mixture without halogen as indicated by Appellant, then compressive stress would not be applicable to any of the claims, as the issued claims and the reissue claims recite a halogen. Likewise, if tensile stress results from a gas mixture containing a halogen as indicated by Appellant, then tensile stress is applicable to all of the claims. Any argument that the patented claims deal with compressive stress and the reissue claims deal with tensile stress is without basis, as a halogen is recited in all the claims. And, as pointed out above, the inherent relationship

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between the stress and the concentration of fluorine is well known as shown in Appellant's graphs (Figs. 9-13) or in Homma (EPO 517,548 or USPN 5,288,578; see col. 4 of the EPO reference) (p. 5).

Accordingly, it is submitted that the fluorine is inherently related to tensile stress, and was inherent in the claims before it was explicitly recited in the claims in the reissue.

(The Declaration of Musaka appears to be inconsistent with Appellant's arguments. While Applicant argues that a compressive stress would result without the flow of the halogen source, the Declaration and Figure 13 indicate that compressive stress exists even when a halogen is present, when the C_2F_6 flow rate is below 450 sccm. When the C_2F_6 flow rate exceeds 450 sccm, the stress changes from compressive to tensile stress (Fig. 13). Since the issued claims do not require the C_2F_6 flow rate to be below 450 sccm (compressive stress), these claims encompass both compressive and tensile stress. As the reissue claims recite tensile stress, the reissue claims are inherently related to the issued claims. Specifically, the reissue claims limit the stress to tensile stress but do not recite the limitations relied upon to overcome the prior art of the issued claims.)

It is further observed that, in the patented claims, the method utilized a gas mixture containing halogen fluorine. In the reissue claims, the method first introduces a gas mixture without halogen, then adds halogen to the gas mixture in the next step. Whether this is done in one step or two steps, they both result in a gas mixture containing a halogen. Thus, in both sets of claims, the layer formed was upon exposure to a gas mixture containing an unspecified halogen (reissue claims) or halogen fluorine (issued claims). This, then is not a material narrowing of the claims.

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(b) Assuming the two step addition of the gas is taken as a material narrowing, and even if the tensile stress could be considered as an additional limitation, the two step addition of gas and the tailoring of the tensile stress would not be a narrowing areas related to (germane to) what was surrendered, i.e., not a narrowing in the area of recapture.

The limitations (1) - (3) were added to overcome the prior art rejection against the claims in the original application. As pointed out above, the applicant made the choice of adding these limitations and retaining only claims which included limitations (1) - (3). The reissue application claims cannot now entirely omit these limitations. This is so, even though claims 27-29 and 31-33 have been narrowed in the reissue application to contain the two-step and stress limitations. As in the case of *Pannu v. Storz Instrument, Inc.*, 258 F.3d 1366, 59 USPQ2d 1597 (Fed. Cir. 2001), the limitations presently added to the claims are not related to (1) the halogen source being fluorine, (2) the fluorine source being CX_4 or $CX_3-(CX_2)_n-CX_3$ and (3) the minimum fluorine concentration being 2.5 atomic percent, all of which are omitted from the claims presently rejected. Following *Pannu*, the present claim subject matter completely omits such limitations, and does not contain a narrowing in the area related to (germane to) the surrender. This is unlike the *Eggert* situation, where the critical relied-upon limitation was not omitted in its entirety, but rather broadened.

Both *Hester Industries, Inc. v. Stein, Inc.*, 142 F.3d 1472, 46 USPQ2d 1641 (Fed. Cir. 1998) and *Pannu v. Storz Instruments, Inc.*, 258 F.3d 1366, 59 USPQ2d 1597 (Fed. Cir. 2001) pointed out that one should look at the limitation relied upon to define the invention over the prior art, and determine if that limitation is omitted in the reissue claims. In the present instance, similar to the facts of *Pannu*, Appellant has broadened the reissue claim in an aspect germane to what was surrendered in response to the prior art rejections, and has not narrowed those claims in the same area—but rather in a different area. That is,

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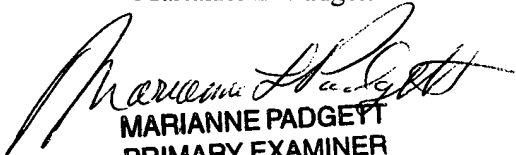
Appellant has broadened the reissue claims by omitting the three limitations necessary to overcome prior art rejections, and has narrowed the stress to tensile stress. Therefore, the decision in *Pannu* is relevant to the issues on appeal because it provides an actual fact situation in which this scenario, where there was narrowing in a different area, was held to be recapture.

In conclusion, the decision of *Eggert*, Appeal No. 2001-0790 (Bd. Pat. App. & Inter., decided May 29, 2003) (precedential opinion of an expanded panel of the Board) is not on point as to the issues at hand. As pointed out above, in *Eggert*, the relied-upon limitation was not omitted in its entirety, but rather was broadened. Thus, the Board found the claims to escape the recapture doctrine. In contrast in the present instance, the relied-upon limitations are omitted in their entirety.

For the above reasons, it is believed that this rejection should be sustained.

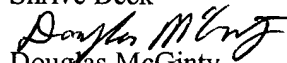
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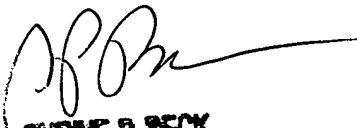
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